Center Innovation Fund: JSC CIF

Dry Electrode Harness System For Wireless 12-LEAD ECG

Completed Technology Project (2011 - 2012)

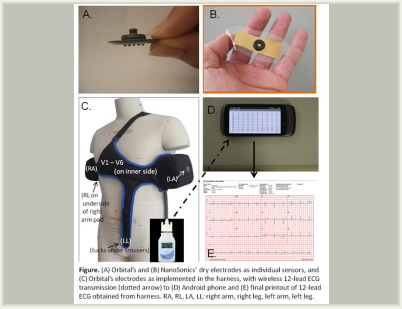
Project Introduction

Human spaceflight requires the ability to obtain diagnostic quality 12-lead electrocardiograms (ECGs). Current systems require significant upmass, volume, and crew training to deploy and maintain. To address this concern, a dry-electrode harness was developed and paired with a PC (and smart phone) to enable high-quality acquisition of ECG. The system 1) collects and wirelessly transmits and stores 12-lead ECG data to a PC or smart phone, 2) can be rapidly donned/doffed, 3) eliminates consumables and resupply issues, and 4) reduces error by removing the "spaghetti' that can cause lead wire misplacement.

The dry-electrode harness is composed of a variety of components. The harness interfaces with the human via a commercial-off-the-shelf (COTS) FDA cleared dry electrode that has been woven in place to a custom designed harness that guarantees correct placement of electrodes to support a diagnostic quality 12-lead ECG. The electrodes themselves are connected to a small, battery powered, COTS ECG system that wireless transmits data to a custom developed software application that receives and processes the data. The dry electrodes replace the more traditional wet-prep electrodes that are single use devices with a specific expiration date. The dry electrodes are multi-use devices and do not have an expiration date. The custom harness essentially automates the process of lead placement which eliminates the "spaghetti" effect that often accompanies traditional ECG data collection and prevents the common clinical problem of lead wire misplacements and reversals. By embedding dry electrodes and wires into the harness, don/doff times are significantly decreased while maintaining a high level of data integrity. Finally, the custom software application simplifies and streamlines the data collection process making the forwarding of ECG data a much easier process.

Anticipated Benefits

It is anticipated that the harness can support both the International Space Station Program and the Human Research Program, by allowing each program to have a reliable and easy manner in which to collect diagnostic quality ECG.



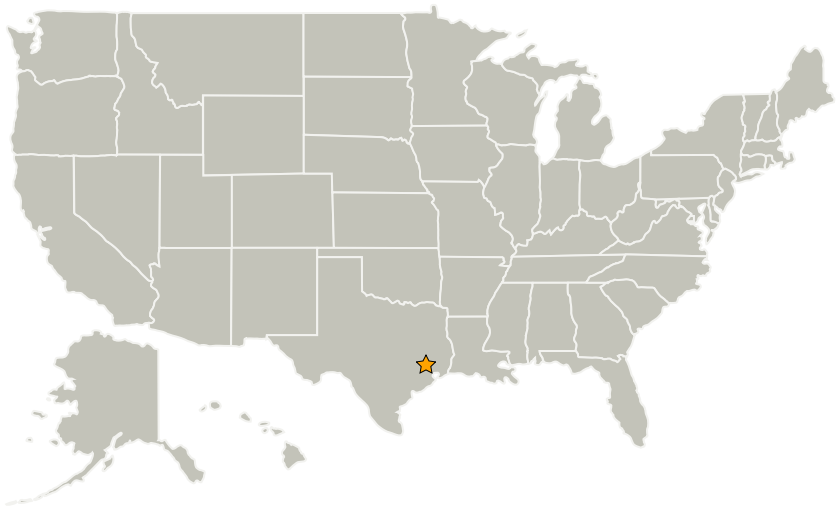
Project Image Dry Electrode Harness System For Wireless 12-LEAD ECG

Table of Contents

Dry Electrode Harness System For Wireless 12-LEAD ECG

Completed Technology Project (2011 - 2012)

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Center Innovation Fund: JSC CIF

Project Management

Program Director:

Michael R Lapointe

Program Manager:

Carlos H Westhelle

Project Manager:

Todd T Schlegel

Principal Investigator:

Todd T Schlegel

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Images

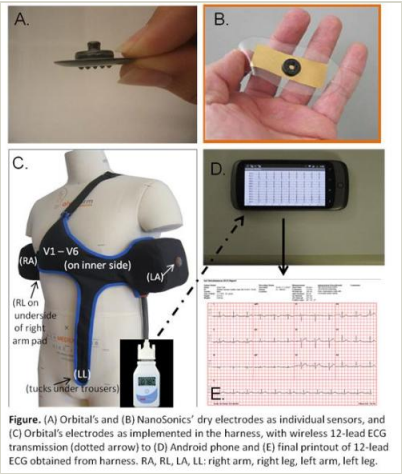

Figure. (A) Orbital's and (B) NanoSonics' dry electrodes as individual sensors, and (C) Orbital's electrodes as implemented in the harness, with wireless 12-lead ECG transmission (dotted arrow) to (D) Android phone and (E) final printout of 12-lead ECG obtained from harness. RA, RL, LA, LL: right arm, right leg, left arm, left leg.

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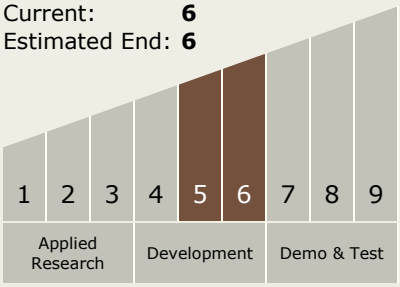
Project Image Dry Electrode Harness System For Wireless 12-LEAD ECG
(https://techport.nasa.gov/image/2361)

Links

Predicting Heart Age Using Electrocardiography
(http://www.techbriefs.com/component/content/article/4-ntb/tech-briefs/information-sciences/20941)

Technology Maturity (TRL)

Start: **5**
Current: **6**
Estimated End: **6**



Technology Areas

Primary:

- TX02 Flight Computing and Avionics
  - TX02.1 Avionics Component Technologies
    - TX02.1.3 High Performance Processors